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ABSTRACTS FROM ASTRONOMICAL PUBLICATIONS.

In accordance with a recent arrangement the members of the scientific staff of the Lick Observatory hold meetings once per week, as an observatory duty, to report upon and discuss the more important articles appearing in the journals of astronomy, the important new books on astronomical subjects, or subjects of current and special interest in the observatory's work. It has been suggested that abstracts of the reports would be of interest to the readers of these Publications, and the Publication Committee has acted favorably upon the suggestion.

It is intended to preserve the qualities of abstracts as far as possible, and to restrict published criticisms, favorable or unfavorable, to a minimum.

THE INFLUENCE OF GRAVITATION ON THE PROPAGATION OF LIGHT.

An interesting case of the mutual relations between apparently widely separated fields of research and of the minutiae which obtrude themselves upon the attention of workers on the very frontiers of the exact sciences is afforded in a paper by EINSTEIN, "Ueber den Einfluss der Schwerkraft auf die Ausbreitung des Lichtes," in *Ann. der Physik*, p. 898, 1911. EINSTEIN finds that, following the theory of relativity, there should be a gravitational effect on the propagation of light. As a result, the lines of the solar spectrum should be slightly shifted toward the red with reference to the positions obtained from terrestrial sources by about one two-millionth. JEWELL, and FABRY and BOISSON have found such shifts to the red of this order of magnitude, but ascribe it to the influence of pressure in the absorbing layer. Since it is known that pressure can influence the position of spectral lines it seems impossible to decide whether such an effect of gravitation exists in this case. EINSTEIN further finds that there should be a deviation or bending of a light ray when passing through a strong field of gravitation. A ray passing close by the Sun should suffer a deviation amounting to 0.83 seconds of arc, the angular distance of a star from the Sun's center being increased by this amount. In the case of *Jupiter* the effect would be only one one-hundredth of this amount. It is pointed out that a comparison of the theory with observation might be made from photographs taken at the time of a total solar eclipse, and it would be of great interest if it should thus be possible

from astronomical observations to prove or disprove a theory in the realm of pure physics. H. D. CURTIS.

ON THE POSITIONS OF THE GAPS IN THE SYSTEM OF MINOR PLANETS IN RELATION TO OTHER DISTANCES IN THE SOLAR SYSTEM.

In *Astronomische Nachrichten*, 4516, Dr. ADALBERT PREY calls attention to an interesting series of numbers that has been found to recur in crystallography, in vibrating strings, in the line groups of spectra, and in the distances in the planetary systems. He gives credit to Professor VICTOR GOLDSCHMIDT, of Heidelberg, for the development of this series, and then goes on to consider it in relation to the gaps in the system of minor planets.

Briefly, the series is developed from the positions of the nodal points in a vibrating string, e. g. a violin string. Taking account of the first four over-tones, these nodal points may be expressed by the series—

$$1 = 0, \frac{1}{5}, \frac{1}{4}, \frac{1}{3}, \frac{2}{5}, \frac{1}{2}, \frac{3}{5}, \frac{2}{3}, \frac{3}{4}, \frac{4}{5}, 1. \quad (1)$$

Transforming this series by the relation $x = (1 - l_1)(l_2 - 1)$, taking $l_1 = 0$ and $l_2 = 1$, a new series results—

$$x = 0, \frac{1}{4}, \frac{1}{3}, \frac{1}{2}, \frac{2}{3}, 1, \frac{3}{2}, 2, 3, 4, \infty. \quad (2)$$

Series (2) is called the normal series and is the one referred to in the first sentence above.

Arranging in distance groups (1) the Sun and the planets *Jupiter* to *Neptunc*, with infinite space as the last term, (2) the Sun and the planets *Mercury* to *Jupiter*, (3) *Jupiter* and the four bright satellites, (4) *Saturn* and satellites 6, 7 and 8, (5) *Saturn* and satellites 1 to 6, and (6) *Uranus* and his four moons, GOLDSCHMIDT gives the following table:—

Normal Series	0	$\frac{1}{5}$	$\frac{1}{4}$	$\frac{2}{5}$	1	$\frac{3}{2}$	2	∞
Group 1	0	..	$\frac{1}{2}$	..	1	...	2	∞
Group 2	0	$\frac{1}{3}$	..	$\frac{2}{3}$	1	...	2	∞
Group 3	0	..	$\frac{1}{2}$	$\frac{2}{3}$	1	...	2	∞
Group 4	0	..	..	..	1	$\frac{6}{5}$	..	∞
Group 5	0	..	$\frac{1}{2}$	$\frac{2}{3}$	1	$\frac{3}{2}$	2	∞
Group 6	0	..	$\frac{1}{2}$	$\frac{2}{3}$	1	$\frac{3}{2}$	..	∞

The fact that only one distance, that of the satellite *Hyperion*, fails to coincide with a number expressing a node point is certainly an interesting coincidence, fully as interesting as the well-known "law" of BODE or TITIUS.

Forming a second series of numbers in a similar manner to express the points of maximum vibration (i. e. the points midway between two corresponding nodes), PREY shows that by taking a series beginning with the Earth and ending with *Jupiter*, the three principal gaps in the system of minor planets coincide with such points. Similarly, by introducing the distance of the Cassini division of *Saturn's* rings into Group 5 above (the inner moons of *Saturn*), it falls upon the point representing the maximum vibration of the first over-tone.

Of course, if there is any significance in the fact that the planets occupy positions at distances from the Sun corresponding to nodal points of a vibrating string any gaps in the system (as in the case of the minor planets) should fall on points representing maximum vibration. PREY's research, therefore, adds to the interest of this curious series of numbers. He has found it impossible to establish any physical significance, however, in these coincidences.

R. G. AITKEN.

PERMANENCY OF PIER CONSTRUCTION.

In the *Astronomische Nachrichten*, No. 4525, Dr. SCHEEL gives a resumé of certain experiments on the permanency of pier construction which is of interest to all who have to do with the mounting of instruments of great delicacy, or those where absolute freedom from alteration is practically a prerequisite, e. g., meridian circles, seismographs, etc. The experiments have been carried out under the auspices of the Reichsanstalt and have extended over the period from 1904 to 1911. The experiment, as carried out, concerned itself chiefly with the varieties of mortar which might be used in such pier construction. For this purpose twelve small pillars were erected of brick, with different mixtures ranging from pure cement to ordinary mortar; these were erected in an underground room in the Reichsanstalt, where reasonable constancy could be secured in the matter of freedom from excessive

ranges of temperature or moisture. The height of all these pillars was carefully followed, at first at frequent intervals, and at longer intervals after several years had passed. The remarkable result of this long series of measures is that all pillars gradually *increased* in length by very small amounts, and that this slow change had not ceased at the end of the six years and a half covered by the experiment. Full data are given in the original article, and it is proposed to repeat the experiment with larger pillars, approximating more closely to the conditions obtaining in actual pier construction.

H. D. CURTIS.